Adaptive Two-Step Peer Methods in Computational Fluid Dynamics

Jens Lang (Technische Universität Darmstadt), Bettina Peth

In this talk, I will summarize our recent activities in constructing higher order variable timestep integrators for computational fluid dynamics [1,2]. I will mainly focus on two-step peer methods which were first developed for ODEs and subsequently applied to parabolic PDEs. Their main advantage over one-step methods lies in the fact that even in the application to PDEs no order reduction is observed. Our aim is to investigate whether the higher order of convergence of the two-step peer methods equipped with variable timesteps pays off in practically relevant CFD computations.

[1] B. Gottermeier, J. Lang Adaptive Two-Step Peer Methods for Incompressible Navier-Stokes Equations, Numerical Mathematics and Advanced Applications 2009, Part II, pp. 387-395, Proceedings of ENUMATH 2009, G. Kreiss. P. Lötstedt, A. Malqvist, M. Neytcheva (Eds.), Uppsala, Sweden

[2] B. Gottermeier, J. Lang Adaptive Two-Step Peer Methods for Thermally Coupled Incompressible Flow, Proceedings of the V European Conference on Computational Fluid Dynamics ECCOMAS CFD 2010 J.C.F. Pereira, A. Sequeira and J.M.C. Pereira (Eds.), Lisbon, Portugal, 14-17 June 2010